

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In the application of:

Masayuki TSUTSUMI et al.

Serial No.: 10/584,398

Filing Date: July 5, 2007

For: POLYIMIDE FILM

Examiner: Shane Fang

Group Art Unit: 1796

Confirmation No. 9225

**APPELLANTS' OPENING BRIEF**

MS Appeal Brief – Patent  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This is a timely appeal from the final rejection of claims 1-9, 11 and 13-19 in this application.

**I. REAL PARTY IN INTEREST**

Toyo Boseki Kabushiki Kaisha, Osaka, Japan, the assignee of appellants' entire right, title and interest in the invention of this application, is the real party in interest on this appeal.

**II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences to the best knowledge of appellants or their undersigned attorney.

**III. STATUS OF CLAIMS**

Claims originally filed: Claims 1-12.

Claims canceled: Claim 10.

Claims added: Claims 13-19.

Claims withdrawn from consideration but not canceled: Claim 12.

Claims allowed: None.

Claims finally rejected: Claims 1-9, 11 and 13-19.

Claims objected to: None.

Claims pending: Claims 1-9 and 11-19.

Claims on appeal: Claims 1-9, 11 and 13-19.

#### **IV. STATUS OF AMENDMENTS**

In a preliminary amendment filed June 23, 2006, with this national stage application, claims 1, 3-9, 11 and 12 were amended, claim 10 was canceled and claims 13-19 were added. In a supplemental preliminary amendment filed October 5, 2006, claims 1, 5, 7 and 12 were amended. In a response filed April, 17, 2009, appellants elected to prosecute claims 1-11 and 13-19 in response to a restriction requirement, claim 12 being withdrawn from consideration. Appellants amended claims 1, 5 and 7 in an amendment filed September 16, 2009. Appellants did not amend any claims in response to the final Action dated December 1, 2009, appealing to the Board instead of filing a response. All amendments have been entered.

#### **V. SUMMARY OF CLAIMED SUBJECT MATTER**

Three independent claims, each defining the invention somewhat differently, are on appeal.

Independent claim 1 is directed to a polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride. This film has a planar orientation coefficient of 0.79-0.89 as measured by an X-ray diffraction method and a dielectric constant of 2.7-3.1 at 100 GHz as measured by a cavity resonance perturbation method.

Independent claim 5 is directed to a polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride to produce a polyamide acid solution, drying the polyamic acid solution to produce a self-supporting green polyamide acid film, passing the green film through a nitrogen purged

continuous type heat treatment furnace to heat the green film to carry out an imidation reaction and cooling the produced film to room temperature to give the polyimide film. This film is characterized by the property such that the amount of water vaporized from the film during heating at 500°C for 10 sec immediately after the helium purge at 170°C for 7 min and preliminary drying is not more than 5000 ppm.

Independent claim 7 is directed to a polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride, wherein the absolute value of the difference between a surface planar orientation degree of one surface (surface A) and a surface planar orientation degree of the other surface (surface B) of the film is 0-2.

#### **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Whether claims 5 and 18 were properly rejected as anticipated by Dalman.

Whether claims 5 and 18 were properly rejected as anticipated by Harris.

Whether claims 7-9, 15, 16 and 19 were properly rejected under 35 USC 103(a) on Harris alone.

Whether claims 1-4, 6, 11, 13, 14 and 17 were properly rejected under 35 USC 103(a) on Dalman in view of Asakura.

Whether claims 1-4, 6, 11, 13, 14 and 17 were properly rejected under 35 USC 103(a) on Harris in view of Asakura.

#### **VII. ARGUMENT**

##### **A. Dalman does not inherently anticipate claims 5 and 18.**

The final rejection of claims 5 and 18 is based entirely on the Examiner's belief that Dalman inherently anticipates these claims. The Examiner's belief is factually unreasonable and legally unsupportable, so this rejection should be reversed.

Claims 5 and 18 are directed to a polyimide film and a base substrate for printed wiring assemblies made from the film of claim 5, respectively, having a specified water evolution

property, as defined in claim 5: wherein the amount of water vaporized at a high temperature during heating at 500°C for 10 sec of the film immediately after helium purge at 170°C for 7 min and preliminary drying is not more than 5000 ppm. In rejecting these claims as anticipated by Dalman, the Examiner did not follow the law, or the instructions set forth in the MPEP.

As set forth in MPEP 2112.IV.:

“In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) (Applicant’s invention was directed to a biaxially oriented, flexible dilation catheter balloon (a tube which expands upon inflation) used, for example, in clearing the blood vessels of heart patients). The examiner applied a U.S. patent to Schjeldahl which disclosed injection molding a tubular preform and then injecting air into the preform to expand it against a mold (blow molding). The reference did not directly state that the end product balloon was biaxially oriented. It did disclose that the balloon was “formed from a thin flexible inelastic, high tensile strength, biaxially oriented synthetic plastic material.” *Id.* at 1462 (emphasis in original). The examiner argued that Schjeldahl’s balloon was inherently biaxially oriented. The Board reversed on the basis that the examiner did not provide objective evidence or cogent technical reasoning to support the conclusion of inherency.).

Thus, the Examiner’s initial burden on an anticipation rejection based on inherency is to present “objective evidence or cogent technical reasoning,” based on the disclosure of the applied prior art, that the claimed characteristic was the *necessary* result of practicing the disclosure of the reference. Until the Examiner provides such objective evidence or technical reasoning, there is no burden on the appellants to rebut such an anticipation rejection based on inherency. Since the Examiner has failed to provide either objective evidence, as opposed to the Examiner’s supposition, or cogent technical reasoning, again as opposed to the Examiner’s supposition, that the water vapor evolution characteristic of the “wherein” clause of claim 5, incorporated by reference into claim 18, is the *necessary* result of practicing Dalman’s disclosure, the Board should reverse the anticipation rejection of claims 5 and 18 on Dalman.

The Examiner’s position is based on his belief that since Dalman discloses reacting an aromatic diamine having a benzoxazole structure (5-amino-2-(p-aminophenyl)benzoxazole) with

an aromatic tetracarboxylic acid anhydride (pyromellitic dianhydride), it is reasonable to assume that Dalman's adduct inherently possesses the water vapor evolution properties set forth in claims 5 and 18. The Examiner's reasoning is set forth in paragraph 3 of the first Action on the merits, dated June 23, 2009, and incorporated by reference into paragraph 2 of the final Action.

Before discussing the logic of the rejection of claims 5 and 18 as anticipated by Dalman, appellants note a possible error in claim interpretation that may be driving the Examiner's position. In paragraph 3 of the Action of June 23, 2009, the Examiner begins the discussion of claim 5 with the following comment: "As to claim 5, a product-by-process claim." The Examiner is partially correct, but partially incorrect. Claim 5 is a product-by-process claim except for the "wherein" clause, which specifies a physical property of the product of claim 5 separate from the steps employed to make it. Appellants note that since the process steps recited in a product-by-process claim do not limit such a claim while it is being prosecuted in the PTO, there exists that chance that the Examiner gave less weight to the "wherein" clause of claim 5 than it deserves in the patentability analysis. In any event, as explained below, the evidence presented by the Examiner does not support his finding that the subject matter of claims 5 and 18 is inherently disclosed by Dalman.

The initial question to be decided on this appeal is, why is the Examiner's finding of inherent disclosure in Dalman a reasonable conclusion based on objective evidence or cogent technical reasoning? The answer is that it is not.

First, the Examiner's reasoning is internally inconsistent and not based on evidentiary fact. What the Examiner seems to be saying that that reacting any aromatic diamine having a benzoxazole structure with any aromatic tetracarboxylic acid anhydride will necessarily produce – that is, *always* produce – a polyimide film having the water vapor evolution characteristic of the "wherein" clause of claims 5 and 18. In none of the prosecution below, however, has the Examiner explained why or how he can draw such a blanket conclusion. This reasoning is tantamount to saying that Dalman necessarily discloses *any* characteristic of a polyimide film

made by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride, regardless of the characteristic and regardless of the specific starting materials. That is not cogent technical reasoning, nor is it based on objective evidence from Dalman's disclosure. If the Examiner's treatment of Dalman is correct, then why didn't he reject independent claims 1 and 7 as well as anticipated by Dalman? There is nothing in the Examiner's reasoning that allows him to single out the "wherein" clause of claims 5 and 18 as being inherently disclosed in Dalman while apparently taking the view that claims 1 and 7 are not.<sup>1</sup> There is no reason or consistency to the Examiner's application of Dalman, which shows that the rejection of claims 5 and 18 as inherently anticipated by Dalman cannot stand.

Second, there is nothing in Dalman that forms a technical basis to think that Dalman inherently discloses the claimed water vapor evolution characteristic. The Examiner has pointed to nothing in the process disclosed in Dalman that demonstrates any recognition that the amount of water residue is to be controlled or provide any means for doing so. Although the Examiner does refer in paragraph 3 of the Action dated June 23, 2009, to the abstract and Example 1 of Dalman as supporting the rejection, consideration of what those disclosures actually say shows that the Examiner's position is devoid of factual basis. Dalman's abstract provides as follows:

A film of polyimidebenzoxazole (PIBO) having an electrically conductive layer adhered to at least one face thereto, wherein the PIBO film has a tensile strength greater than 200 MPa. A printed wiring board having at least one dielectric layer and at least one circuitry layer wherein at least one dielectric layer is a PIBO film. A printed wiring board (PWB) having at least one polyimidebenzoxazole (PIBO) dielectric layer wherein the PWB has at least one thin dielectric base material layer, at least one thin conductor, at least one narrow conductor width and at least one small diameter via.

That is it, nothing more. Where, appellants ask, is there any basis whatever in logic or technical analysis for believing that this meager passage supports the Examiner's finding that Dalman discloses a product inherently satisfying the water vapor evolution properties specified in the

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<sup>1</sup> As appellants will show below, the Examiner's application of Harris against claims 5 and 18 suffers from the same logical deficiency.

“wherein” clause of claim 5? The answer is apparent: there is no such basis. Example 1 of Dalman is no better as a disclosure supporting the Examiner’s inherency finding, since there is nothing in that Example that gives the slightest inkling of the property described in the “wherein” clause of claim 5.

The Examiner may retort that the essence of an inherency-based rejection is that the reference does not have to mention the allegedly inherent characteristic, but such a response begs the question of why the Examiner looked to Dalman in the first place as showing the “wherein” clause of claims 5 and 18. Since Dalman is absolutely silent on any need to control water vapor evolution and does not provide any way by which such a result may be obtained, there is no objective evidence in Dalman that the claimed characteristic is inherent – i.e., *has to occur* – in any film made in accordance with Dalman’s disclosure. By contrast, the process steps recited in claim 5 do result in films having the claimed properties; as a result, the differences between the process claimed in claim 5 and the processes disclosed in Dalman are such that it is not reasonable for the Examiner to try to shift the burden of proof to appellants to overcome an alleged case of inherency.

Dalman does not disclose or suggest the film product having the water residue properties of claims 5 and 18, so this rejection should be withdrawn.

**B. Harris does not inherently anticipate claims 5 and 18.**

Claims 5 and 18 stand rejected as anticipated by Harris for the same reasons as articulated with respect to Dalman. This rejection should be reversed for the same reasons stated as to Dalman. The Examiner has no basis in objective fact or technical reasoning to conclude that Harris inherently discloses the water residue properties set forth in claims 5 and 18.

In paragraph 4 of the Action of June 23, 2009, incorporated by reference into paragraph 3 of the final Action, the Examiner indicated that Harris was applied on the same basis as Dalman – “the same rationale as applied in the above [sic] paragraph 3” – and referred to Examples 1 and 3 and Comparative Example A of Harris. The Examiner provided no explanation whatever as to

why or how the cited disclosure of Harris provides any rational basis for rejecting claims 5 and 18 as inherently anticipated by Harris, which betrays no recognition whatever of the characteristics of the “wherein” clause of claims 5 and 18. Appellants do not wish to belabor the point, but the Examiner’s explanation of Harris is even more deficient than his explanation of Dalman. For the Examiner to be able to impose the burden on appellants to disprove inherency, he must provide “objective evidence or cogent technical reasoning to support the conclusion of inherency” as set forth in MPEP 2112.IV. As the Board can see, the final Action provides neither. The rejection of claims 5 and 18 is based on nothing more than the Examiner’s say-so, which is factually and legally insufficient to support the rejection. The final rejection of claims 5 and 18 as anticipated by Harris should be reversed.

**C. The obviousness rejection of claims 7-9, 15, 16 and 19 on Harris alone should be reversed**

In paragraph 8 of the final Action, the Examiner finally rejected claims 7-9, 15, 16 and 19 on Harris alone, relying on essentially the same disclosure, Examples 1 and 3 and Comparative Example A, as he did in rejecting claims 5 and 18 as anticipated by Harris. The Examiner admits that Harris does not identically disclose the inventions of the rejected claims but contends that the subject matter of the rejected claims would have been obvious because Harris discloses controlling the solvent residue level of the polyimide precursor to 10-35%, which allegedly overlaps the 25% level taught in the specification.

The problem with the Examiner’s reasoning is that it assumes what it must establish, on two levels. First, the Examiner must again be relying on inherent disclosure in Harris of some kind since he admits that Harris fails to disclose many features of the rejected claims, such as the difference between surface planar orientation degrees of the surfaces recited in claim 7 (from which rejected claims 8, 9, 15 and 19 depend) and the surface planar orientation of claim 8 (from which rejected claim 16 depends). The Examiner does not contend that the allegedly inherent features of claims 7 and 8 would have been known to persons of ordinary skill in the art at the time appellants’ invention was made. It is, however, well settled that, as set forth in MPEP

2141.02.V., “Obviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established. *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993).”

Second, the final rejection assumes that controlling the solvent residue level in Harris’s process will produce the claimed difference in surface planar orientation properties. The Examiner seems to think that the invention would have been obvious from Harris because of a supposed overlap in solvent ranges where Harris is devoid of any disclosure that would have led a person of ordinary skill in the art to consider the disclosed solvent range to be related to the characteristics of claims 7 and 8 that the Examiner admits are not disclosed in Harris. There is no evidence in Harris to support such a supposition, and the Examiner fails to provide a reasoned technical explanation as to why any person of ordinary skill in the art would have had any *reason* to depart from what Harris discloses – the Examiner concedes that Harris does not identically disclose the invention of claims 7-9, 15, 16 and 19 by making the rejection for obviousness instead of anticipation – so as to arrive at the invention of these rejected claims.

In the end, the final rejection of claims 7-9, 15, 16 and 19 on Harris alone must be reversed.

**D. The obviousness rejections of remaining claims 1-4, 6, 11, 13, 14 and 17 under 35 USC 103(a) on Dalman or Harris in view of Asakura should be reversed**

The Examiner takes the position in paragraphs 6 and 7 of the final Action that Asakura discloses the planar orientation coefficient of claim 1 and the motivation to achieve it, admitting that Dalman and Harris are both silent on this limitation of claim 1 (and thus of all of the claims directly or indirectly depending from claim 1, rejected claims 2-4, 6, 11, 13, 14 and 17). The Examiner also admits that all three references are silent on the properties of dielectric loss/constant, ratio of dielectric constant and density set forth in claims 2-4, 6, 13 and 14. However, the Examiner papers over these deficiencies by stating that “one of ordinary skill in the

art would have expected the resultant polyimide to feature the same properties.” Final Action, page 5.

First, the Examiner’s basic logic assumes what it must prove. That is, why – based on evidence as opposed to supposition – would “one of ordinary skill in the art [ ] have expected the resultant polyimide to feature the same properties”? The Examiner does not say why, nor is there anything in the cited references to support such a conclusion. It is not enough for the Examiner simply to proclaim findings without a basis in the evidence of record for them.

Second, the Examiner’s reasoning fails to address the dielectric constant range set forth in claim 1 (which is different from the dielectric loss tangent set forth in claim 2). Dalman discloses a dielectric constant range of between about 2 and 3.3 from about 1 MHz to 1 GHZ, while claim 1 specifies a dielectric constant range of 2.-3.1 at *100* GHz, far above what Dalman discloses. Harris does not disclose a dielectric constant at all. Therefore, the Examiner has not provided a reasoned basis why it would have been obvious to arrive at the dielectric constant range of claim 1. As explained above, it is improper to rely on inherency to support an obviousness rejection unless the alleged inherent subject matter would have been recognized by persons of ordinary skill in the art as existing in the prior art at the time the invention was made. MPEP 2141.02.V. (“Obviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established.”)

Third, the Examiner is assuming without objective evidence or supporting technical reasoning that the planar orientation coefficient values reported in Asakura would be the same as for the claimed films. The Examiner has to admit that Asakura’s films are not the same as those claimed in this application. It is therefore inaccurate for the Examiner to argue that Asakura’s disclosed range of planar orientation coefficients overlaps the claimed range because the Examiner is comparing apples with oranges. The Examiner has provided no evidence that persons of ordinary skill in the art would have arrived at the planar orientation coefficient values for appellants’ claimed films based on Asakura’s disclosure of different films without the use of

prohibited hindsight. Indeed, the rejections relying on Asakura do rely on hindsight because there is nothing in Dalman or Harris that would have given persons of ordinary skill in the art any reason to look to Asakura's disclosure of different films unless they knew of appellants' invention in the first place.

Finally, as to claims 2-4, 6, 13 and 14, the Examiner is relying on inherent disclosure in Dalman and Harris to complete cases of obviousness. As explained in MPEP 2141.02.V., this reliance is improper.

Accordingly, the final rejections of claims 1-4, 6, 11, 13, 14 and 17 under 35 USC 103(a) on Dalman or Harris in view of Asakura should be reversed.

### **VIII. CLAIMS**

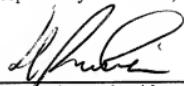
The claims on appeal are set forth in the attached Appendix of Claims on Appeal.

### **CONCLUSION**

For the foregoing reasons, the final rejection of claims 1-9, 11 and 13-19 should be reversed.

In the event that the transmittal letter is separated from this document and the Patent and Trademark Office determines that an extension and/or other relief is required, appellants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952, referencing docket no. 358362011300.

Respectfully submitted,

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## APPENDIX OF CLAIMS ON APPEAL

1. A polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride, which film has a planar orientation coefficient of 0.79-0.89 as measured by an X-ray diffraction method and a dielectric constant of 2.7-3.1 at 100 GHz as measured by a cavity resonance perturbation method.

2. The polyimide film of claim 1, having a dielectric loss tangent at 100 GHz of 0.0001-0.03 as measured by the cavity resonance perturbation method.

3. The polyimide film of claim 1, having dielectric constants of 2.7-3.1 at 1 GHz and 2.6-3.0 at 100 GHz, as measured by the cavity resonance perturbation method.

4. The polyimide film of claim 1, which has a density of 1.47 g/cm<sup>3</sup> - 1.55 g/cm<sup>3</sup>.

5. A polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride to produce a polyamic acid solution, drying the polyamic acid solution to produce a self-supporting green polyamide acid film, passing the green film through a nitrogen purged continuous type heat treatment furnace to heat the green film to carry out an imidation reaction and cooling the produced film to room temperature to give the polyimide film,

wherein the amount of water vaporized at a high temperature during heating at 500°C for 10 sec of the film immediately after helium purge at 170°C for 7 min and preliminary drying is not more than 5000 ppm.

6. The polyimide film of claim 1, wherein the ratio ( $\epsilon_{65}/\epsilon_D$ ) of the dielectric constant  $\epsilon_{65}$  at 100 GHz of the film humidity-conditioned under a constant temperature and humidity conditions of 20°C, 65% RH for 94 hr, as measured by the cavity resonance perturbation method, to the dielectric constant  $\epsilon_D$  at 100 GHz of the film vacuum dried under the conditions of 120°C, for 24 hr, as measured by the cavity resonance perturbation method, is within the range of 1.00-1.10.

7. A polyimide film obtained by reacting an aromatic diamine having a benzoxazole structure with an aromatic tetracarboxylic acid anhydride, wherein the absolute value of the

difference between a surface planar orientation degree of one surface (surface A) and a surface planar orientation degree of the other surface (surface B) of the film is 0-2.

8. The polyimide film of claim 7, wherein the surface planar orientation degree of the film surface having a higher surface planar orientation degree is not more than 15.

9. The polyimide film of claim 7, which has a curling degree of 0%-5%.

11. A base substrate for printed wiring assemblies, which comprises the polyimide film of claim 1.

13. The polyimide film of claim 2, having dielectric constants of 2.7-3.1 at 1 GHz and 2.6-3.0 at 100 GHz, as measured by the cavity resonance perturbation method.

14. The polyimide film of claim 2, which has a density of 1.47 g/cm<sup>3</sup> - 1.55 g/cm<sup>3</sup>.

15. The polyimide film of claim 7, wherein the ratio ( $\epsilon_{65}/\epsilon_0$ ) of the dielectric constant  $\epsilon_{65}$  at 100 GHz of the film humidity-conditioned under a constant temperature and humidity conditions of 20°C, 65% RH for 94 hr, as measured by the cavity resonance perturbation method, to the dielectric constant  $\epsilon_0$  at 100 GHz of the film vacuum dried under the conditions of 120°C, for 24 hr, as measured by the cavity resonance perturbation method, is within the range of 1.00-1.10.

16. The polyimide film of claim 8, which has a curling degree of 0%-5%.

17. A base substrate for printed wiring assemblies, which comprises the polyimide film of claim 4.

18. A base substrate for printed wiring assemblies, which comprises the polyimide film of claim 5.

19. A base substrate for printed wiring assemblies, which comprises the polyimide film of claim 7.

**EVIDENCE APPENDIX**

[NONE.]

**RELATED PROCEEDINGS APPENDIX**

[NONE.]